sociate. It is likewise assumed that 90 and, 80 per cent of the hydrogen is consumed and the oxygen remaining is combined with the carbon and carbon monoxide. These assumptions may not be correct, but they supply a base for the purpose desired and data covering the case have not been found. Several other assumptions were made and tried, but the one given seemed to average up with the others within 4 or 5 per cent; therefore it was used. The amount of heat released and the products of combustion were computed in the same manner as for complete combustion, except that the unconsumed hydrogen and carbon monoxide were carried into the products of combustion as shown in the computations on Table 1.

Table 2 is a tabulation of the air supply and the products of combustion for various percentages of the theoretical air supply ranging from 60 to 500 per cent. These values are selected with a view to facility in computation; that is, the volume of excess air or deficiency in air, in the second and fourth lines of the table, is the same as the volume of oxygen for complete combustion, and the other values in this column are simple multiples of this value. The deficiency or excess of oxygen is one-fifth of the excess or deficiency in the air supply. The excess of nitrogen is the difference between the excess air and the excess oxygen. The total nitrogen is obtained by adding the excess nitrogen to the volume of nitrogen in the products of combustion with 100 per cent air supply. The last column, total products of combustion, is obtained by adding the excess air to the total volume of products of combustion with 100 per cent air supply.

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Table 3 is the computation of the points for the heat capacity curves of the products of combustion resulting from 100-g molecules of the gas. For the case in hand the computation has been carried to ridiculous limits in order to determine the limiting combustion conditions both with excess air and with a deficiency of air. This point is of some importance in connection with the use of producer and blast furnace gases, and in certain applications of these gases it has been found necessary to

use an auxiliary coal fire in order to insure ignition. It is well known that with both of these gases the flame may be extinguished by an excess of air cooling the products of combustion and the heating chamber below the ignition temperature of the gases. Similar difficulties